



## NATURAL RESOURCES CONSERVATION SERVICE CONSERVATION PRACTICE STANDARD

### STORAGE FACILITY- NURSERY SUBSTRATE

Interim Standard

Code 802

(No.)



#### DEFINITION

A facility that provides storage for nursery pre-mixed substrate and/or other materials used to mix nursery substrate.

#### PURPOSE

To decrease non-point source pollution of surface and groundwater resources.

#### CONDITIONS WHERE PRACTICE APPLIES

This practice applies to all areas where soils, geology, and topography are suitable for construction of the facility and where

- pre-mixed substrate and/or fertilizer-laden materials used for mixing nursery substrate are stored for potting plants, and/or
- the substrate is exposed to rainfall for sufficient time that leachate will move through the substrate medium either from surface runoff or leaching through the soil, and/or
- temporary storage of substrate under a non-structural cover is needed.

#### CRITERIA

##### General Criteria for Applicable To All Storage Facility-Nursery Substrate.

**Laws and regulations.** Plan, design, and construct nursery substrate storage facility to comply with all Federal, state, and local laws, rules, and regulations.

Evaluate and avoid or minimize impact to cultural resources, wetlands and Federal and state protected species to the extent practicable during planning, design and implementation of this conservation practice in accordance with established National and Florida policy, General Manual (GM) Title 420-Part 401; Title 450-Part 401, Title 190-Parts 410.22 and 410.26, National Planning Procedures Handbook (NPPH) Florida Supplements to Parts 600.1 and 600.6, National Cultural Resources Procedures Handbook

Conservation practice standards are reviewed periodically and updated if needed. To obtain the current version of this standard, contact the Natural Resources Conservation Service.

(NCRPH), National Food Security Act Manual (NFSAM), and the National Environmental Compliance Handbook (NECH).

**Design storage volume.** Determine the minimum design volume based on the total amount of substrate and/or substrate mixing material that will be stored during the owner's maximum utilization period for potting materials. Include in the total volume the remaining material plus the new material when the substrate and/or substrate mixing material is restocked.

**Design Dimensions.** Design the height and width of the facility to account for equipment size and operation needs for transfer of material to and from the facility.

**Location.** Locate the storage facility as follows:

1. As close as possible to the potting and grow out areas.
2. As far as practical from streams, ponds, lakes, wetlands, sinkholes or subsurface anomalies, and water wells.
3. Near natural windbreaks, where possible, to protect the covering from blowing winds.
4. Within property boundary limits as required by local laws and regulations.

**Wall Design.** Consider the anticipated stacking angle of the substrate in determining the wall height. Construct stacking and storage facilities using durable materials such as reinforced concrete, reinforced concrete block, or treated lumber. Design facilities with adequate safety factors to prevent failure due to internal or external pressures, including hydrostatic uplift pressure and imposed surface loads such as equipment which may be used within, on, or adjacent to the structure. Use of lumber is not permitted for walls that support moving stacking elevators or similar loads.

Use pressure-treated timber in accordance with ASTM D1760. Design post size, spacing, and embedment based on a structural design analysis of the facility. Posts shall be a minimum nominal size of 6 inches by 6 inches and embedded a minimum of 3 feet in the ground. Use treated lumber with a minimum thickness of 2 inches for side planking.

**Storage pad.** Pads may be constructed of soil, geomembrane, or concrete. Design the pad to be essentially level with only minimal gradient away from the center of the pad to allow drainage of excess water.

Provide positive drainage away from the storage area in all directions. Where needed, use conservation practices such as Diversions Code 362 and/or Grassed Waterways, Code 412 to divert surface water away from the storage areas.

Soil liner. Construct soil pads of clayey material (SC, CL) with a minimum thickness of 1 foot. Install soil pads under optimum moisture conditions and compact in 6 to 8 inch lifts. Use of soil pads is not permitted where the seasonal high water table will be less than 2 feet below the bottom of the stacked substrate.

Synthetic liner. If a synthetic liner is used, excavate the pad area to a depth of one foot below the planned elevation and remove all sharp stones and other sharp material to prevent puncturing the liner. Then cover the liner with one foot of soil free of stones, clogs, etc. Use geomembrane that is a minimum thickness of 20 mils. Geomembrane pads are not permitted where the seasonal high water table will be less than 2 feet below the bottom of the geomembrane.

Concrete pad. Construct concrete pads a minimum of 4 inches thick on a firm foundation. Concrete shall have a minimum compressive strength of 4000 psi and meet National Engineering Handbook (NEH) 642 Construction Specification 32, Structure Concrete. Construction of concrete pads is not permitted where the seasonal high water table will be less than 1 foot below the bottom of the concrete.

Slope concrete pad away from the entrance. Suggested grade of the concrete pad is 0.2 or 0.3 percent. Where concrete floors contact wooden walls or posts, separate the concrete and wood by ½-inch preformed bituminous expansion joint material. The expansion joint material is not required where wooden walls rest on top of concrete and the resultant joint is horizontal.

**Protection.** Vegetate all disturbed areas beyond the edges of the pad with an approved vegetative cover in accordance with Florida NRCS conservation practice standard, Critical Area Planting, Code 342.

**Additional Criteria for Permanent Covered Fabricated Structures**

When the roofed storage facility is also to be used for the potting operation, account for the necessary work area.

Provide a concrete pad for covered fabricated facilities.

**Roofs and Covers.** Design the roofs and covers to meet the requirements of Florida NRCS conservation practice standard Roofs and Covers, Code 367.

**Service life and durability.** Ensure planning, design, and construction of the structure is sound and of durable materials commensurate with the anticipated service life, initial and replacement costs, maintenance and operation costs, and safety and environmental considerations.

**Foundation.** The foundations of fabricated storage facilities shall be proportioned to safely support all superimposed loads without excessive movement or settlement.

**Structural loading.** Design storage structures to withstand all anticipated loads including internal and external loads, hydrostatic uplift pressure, concentrated surface and impact loads, and water pressure due to seasonal high water table in compliance with this standard and applicable local building codes.

Design roof wind loads in accordance with ASCE7-10, Minimum Design Loads for Buildings and Other Structures or other controlling criteria. Consider the total load in the structural design if the facility is to serve as part of a foundation or support for a building.

**Concrete slabs on grade.** Consider in the design the required performance and the critical applied loads along with both the subgrade material and material resistance of the concrete slab.

Where applied point loads are minimal and liquid-tightness is not required and the subgrade is uniform and dense, the minimum slab thickness shall be 4 inches with a maximum joint spacing of 10 feet. Joint spacing can be increased if steel reinforcing is added based on subgrade drag theory.

When heavy equipment loads are to be resisted and/or where a non-uniform foundation cannot be avoided, use an appropriate design procedure incorporating a subgrade resistance parameters such as ACI 360.

**Additional Criteria for Non-Structural Cover Stacking and Storage.**

**Size.** Design the non-structural covered areas to stack and store the substrate material until it can be properly used as identified in the conservation plan and the utilization schedule.

**Non-structural covered facility without wall.** Allow for a minimum of 4 feet of horizontal freeboard around the edges of the pile to properly anchor the covering and facilitate removal and utilization of the substrate.

**Non-structural covered facility with wall.** Design the size of the pad on which the substrate will be stored based on the volume required for the potting schedule and the anticipated height of the stack. A maximum height of 7 feet for stacking the substrate material is allowed.

**Cover.** Cover substrate material with opaque plastic or polyethylene sheeting having a minimum thickness of 6 mils or other waterproof covering. Place the sheeting over the substrate pile with care to prevent tearing. Sheeting shall have a minimum of 24 inches of overlap. Place weights over the sheeting to anchor it and prevent tearing during high winds.

Anchor the sheeting at the base of the substrate pile with sufficient weights to hold the sheeting in place. In lieu of weights, sheeting may be securely attached to screw type anchors placed on 2-foot centers around the pad.

## CONSIDERATIONS

Proper construction of the pad and maintenance of the covering should prevent leachate or percolation water through the stack and into the groundwater. Consider the additional runoff from the covering in the water management around the stack.

Runoff should be directed to a vegetated swale or filter for treatment or a designed stormwater retention treatment system.

Consider monitoring the temperature of the substrate stack to ensure temperature does not reach unsafe levels.

The storage facility should be located as close to the potting and transfer station as possible. Consider traffic flow for delivery and utilization.

The site should be located considering prevailing winds and landscape elements such as building arrangement, landform, and vegetation to enhance visual resources and reduce traffic safety problems.

To facilitate the removal of substrate from the storage area and prevent disturbance to the surrounding area, consider using a permanent pad such as concrete.

Consideration should be given to economics, environmental concerns, and the overall nursery management plan.

The storage facility will have very little impact the water budget. The affect will be dependent upon the size of the storage facility and pre/post development runoff calculations.

The storage facility should have an overall positive impact on water quality by storing substrate material and prevent potential polluted runoff and leachate from entering groundwater and surface water.

## PLANS AND SPECIFICATIONS

Prepare plans and specifications in keeping with this standard and describe the requirements for applying the practice to achieve its intended purpose. Prepare plans and specifications for specific field sites. Plans and specifications include construction plans, photographs, drawings, job sheets, construction specifications, narrative statements in conservation plans, and other similar documents.

Include on the construction plans as a minimum:

- A plan map showing the location of all storage areas, access roads to these areas, slopes, surfaces to be graded, and necessary cuts and fills.
- Structural details for covered facilities.
- Type of pad and thickness, length, width, structural details, etc.
- Pad elevations.
- Grading and drainage plan.
- Dimensions of storage area including length, width and material specifications.
- Maximum height for stacking substrate.
- Type and quality of nonstructural covering and details for anchoring the cover.
- Placement of spoil from excavation for the pad.
- Auxiliary practices such as access roads, diversions, waterways, and subsurface drains, as applicable.
- Vegetative requirements.
- Copies of the plans and specifications shall be given to the client.
- Location and notification of utilities.

## OPERATION AND MAINTENANCE

Develop an operation and maintenance plan that is consistent with the purposes of the practice; its intended life, safety requirements, and the criteria for its design. Inspect the substrate storage facility periodically to ensure that all components are operating as planned.

Include appropriate safety features and operation to minimize hazards at the facility.

To prevent spontaneous combustion, substrate in the stacking should not have less than 40 percent moisture. Do not layer dry material and moist material. Limit the height of the stack to 7 feet, with substrate to wood contact limited to 5 feet.

Soil pads may require reconstructing if soil materials are inadvertently removed during the substrate removal process. The plastic or polyethylene covering will deteriorate over time and will need to be replaced. Inspect the pad, cover, and adjacent area after each major storm event. Complete needed repairs promptly.

Where geomembranes are used for pads, care must be taken during removal of the substrate to not damage the geomembrane.

Check concrete pads for cracks after removal of substrate and repair cracks immediately.

Vegetate areas disturbed as a result of removing the substrate immediately.

Maintain the area surrounding the field storage area in such a manner to prevent ponding of water and to ensure runoff is diverted from the pad.

## REFERENCES

ACI 318, 360, 530

ASCE 7-10 Specifications

ASTM D 653, D 698, D1760, D 2488

Basic Building Code, 12th Edition, 1993, Building Officials and Code Administrator, Inc. (BOCA)

Florida NRCS Conservation Practice Standards:

    Critical Area Planting, Code 342

    Roofs and Covers, Code 367

    Diversions, Code 362

    Grassed Waterway, Code 412

General Manual (GM)

    Title 420-Part 401

    Title 450-Part 401

    Title 190-Parts 410.22 and 410.26

National Cultural Resources Procedures Handbook

National Engineering Manual, Part 520

National Environmental Compliance Handbook

National Food Security Act Manual

National Planning Procedures Handbook Florida Supplements to Parts 600.1 and 600.6